

GOALS AND OBJECTIVES

The goal of the Los Angeles County Monitoring Program is to provide technical data and information to support effective watershed stormwater quality management programs in Los Angeles County. Specific objectives of the Program, as outlined in the Municipal Permit, are:

- tracking water quality status, pollutant trends and pollutant loads, and identifying pollutants of concern;
- monitoring and assessing pollutant loads from specific land uses and watershed areas;
- identifying, monitoring, and assessing significant water quality problems related to stormwater discharges within the watershed;
- identifying sources of pollutants in stormwater runoff;
- identifying and eliminating illicit discharges;
- evaluating the effectiveness of management programs, including pollutant reductions achieved by implementation of Best Management Practices; and
- assessing the impacts of stormwater runoff on receiving waters.

The 1998-99 Monitoring Program was designed to address these objectives through the implementation of three elements: land use station monitoring, mass emission station monitoring, and critical source/BMP monitoring. The County also is addressing illicit discharges through an inspection program.

LAND USE AND MASS EMISSION STATION MONITORING

Stations and Equipment

Land use stations are defined as relatively small catchments (0.1 to over 5 square miles) that have one predominant land use. The objectives of land use monitoring are to evaluate possible effects of land use on water quality, to evaluate the relative importance of land uses as pollution sources; and to provide data that can be used, along with data from mass emission stations, to project watershed pollutant loads. Data were obtained from eight land use stations during the 1998-99 storm season: one vacant, one single family high density residential, one multiple family residential, one mixed residential, one commercial, one light industrial, one transportation, and one educational. Land use stations were equipped with automatic water samplers and stage (water depth) recorders so that flow composite samples could be obtained. Grab samples were not required from land use stations.

In contrast to land use stations, mass emission stations monitor relatively large (100 to 1000 square miles) mixed land use watersheds. Runoff from five mass emissions monitoring stations was sampled during the 1998-99 storm season. These stations cumulatively represented a total of 1619 square miles of drainage area. The Permit requires mass emission monitoring of four major drainage areas, namely: Ballona Creek, Malibu Creek, Los Angeles River, and San Gabriel River. The purpose of the mass emission monitoring is to support stormwater load estimates and to provide a basis for long term water quality trend analysis. Therefore, the

monitoring stations are located as close as practical to where the creeks and rivers enter the ocean. Mass emission stations are equipped with automated water samplers and stage recorders to collect composite stormwater samples during storm events. Grab samples were also taken at these stations in accordance with the Municipal Permit. Composite samples only were collected from one additional mass emission station (Coyote Creek) to support loadings analyses for the San Gabriel River watershed. A minimum of five storms were sampled at all mass emission stations during the 1998-99 storm season, as required under the 1996 Permit.

Hydrologic Conditions and Sampling Success

While last year's El Niño season produced twice as much rainfall as normal, the rebound effect from this year's La Niña season produced less than half the normal rainfall. Sixteen storms were sampled during the season, compared to 29 last season. This year's wet season rainfall was only 6.81 inches at the downtown Los Angeles gage, with the bulk of the rain falling in April, as compared to over 33 inches of rainfall last season. In addition, for the month of February, this season's total rainfall was only 0.40 inches compared to 15.24 inches last year. Similarly, the total rainfall for the 1998-99 season at the Ballona Creek station was only 9.48 inches and the total wet season runoff volume at the Ballona Creek station was 10,700 acre-ft. By comparison, the rainfall total last storm season at this station was 28.28 inches and the runoff volume was over 18,300 acre-ft.

Water Quality Chemical Analysis

Monitoring in Los Angeles County in 1998-99 was performed in compliance with the Municipal Permit issued in July 1996 which requires a broad suite of chemical analyses, including solids, minerals, bacteria, metals, organics, and nutrients. The Los Angeles County Department of Agricultural Commissioner/Weights and Measures, Environmental Toxicology Laboratory provided the water quality laboratory and related services to the Department of Public Works. The laboratory implemented a Quality Assurance/Quality Control program to ensure that the analyses conducted are scientifically valid, defensible, and of known precision and accuracy.

Water Quality Results (Mass Emission Study)

- A comparison of mass emission event (seasonal) mean concentrations to objectives in the Los Angeles Basin Plan, the California Ocean Plan, and the California Toxics Rule produced a list of five constituents of concern; cyanide, total and fecal coliforms, dissolved copper, and bis(2-ethylhexyl)phthalate.
- Samples collected at the LA. River at Wardlow had the highest median and mean concentrations of suspended solids, and showed the widest distribution (i.e., highest variability) in concentrations. The same station (LA. River at Wardlow) also had the highest median and mean concentrations of suspended solids in the five-year cumulative data set.
- Stations that peaked in a certain parameter in 1998-99 did not necessarily peak in the five-year data set.

- Different parameters peaked at different stations, both in the one-year and the five-year datasets. In other words, there was no apparent trend of "cleaner" versus "less clean" watersheds.
- There were several individual exceedances of water quality objectives, either of the California Toxics Rule or of the Ocean Plan (or of both), for total metals; however, the only heavy metal that had a seasonal mean or median exceed an objective was dissolved copper. Further, except for dissolved copper, there were very few individual exceedances of dissolved metals, which are the form of heavy metal that are considered bioavailable (and therefore potentially toxic).
- Total coliforms and fecal bacteria (fecal coliforms, fecal streptococcus, and fecal enterococcus) were detected in all samples tested except for the December 1, 1998 storm.
- Bacteria densities observed during the first storm of each rainy season were not necessarily higher than during consecutive storm events, suggesting that there was no apparent "first-flush" effect in these watersheds. (Toxicity results showed otherwise).
- Except for somewhat lower bacteria densities at Malibu Creek, there was no seasonal or regional consistency in cell densities.
- There was one storm event, January 9, 1998, that yielded extremely high counts in all stations for all bacterial strains.
- The 1996-97 season had one event, November 21, 1996, that yielded runoff with high counts in all stations for all species.
- During the 1998-99 season, the event of March 15, 1999 was associated with high bacterial counts for most stations and the events of March 25, 1999 and April 4, 1999 were associated with unusually low counts for most stations.
- Dry weather flows contained bacteria at much lower densities (three to four orders of magnitude lower) than wet weather flows.
- Wet weather toxicity to sea urchin fertilization was significant for the Los Angeles River for both storms sampled this season. This is consistent with last year's findings.
- Wet weather toxicity in the San Gabriel River was not significant this year. This finding is in contrast to last year's findings that indicated toxicity was significant.
- Dry weather toxicity to sea urchin fertilization in the Los Angeles River was significant, a result that differs from last year. There was no significant dry weather toxicity to sea urchin fertilization from the San Gabriel River which is the same as last year.
- Toxicity was higher at the beginning of the storm season.
- For a small (0.71") storm on an urbanized watershed, the GIS loading model calculated runoff volume within 35% of the observed value. Loadings for a few select heavy metals were similarly within 15% to 29%, indicating the land use EMCs for these constituents are reasonable. Total suspended solids loading was 26% lower than observed.

Water Quality Results (Land Use Study)

- Runoff from the vacant catchment had high pH (8.5) and high alkalinity (median of 175 mg/l), while runoff from the light industrial, transportation, and mixed residential stations had lower median pH values (6.9, 6.9, and 6.8 respectively) and lower median alkalinity concentrations (22, 18, and 16 mg/l respectively). The commercial station fell in between these two extremes with a median pH of 7.6 and a median alkalinity of 76 mg/l.
- Median hardness concentrations follow the alkalinity pattern: high (190 mg/l) at the vacant station; low in the light industrial (35 mg/l), transportation (30 mg/l), and mixed residential stations (24 mg/l); and in between (134 mg/l) at the commercial station.
- TSS results overlapped substantially among the different land uses, however the range of values was larger for the mixed family residential, commercial, and light industrial stations in the 1998-99 season. The light industrial station had the highest mean and median for TSS (152 mg/l and 157 mg/l) being approximately twice as high as the next highest mean and median (86 mg/l and 40 mg/l for multi-family residential).
- Total and dissolved copper concentrations overlapped among the different land uses, however the range of values was larger for the transportation station in the 1998-99 season. The cumulative pattern is similar except that larger ranges are observed at both the light industrial and transportation stations for total copper. Dissolved copper generally exceeds the 4.8 µg/l California Toxics Rule standard while total copper exceeds the Ocean Plan objective more frequently in the commercial, light industrial, and transportation stations. In these cases, exceedance of the objective does not mean being out of compliance. All other tested heavy metals were below the objective.
- Total lead results are fairly consistent among land uses both in the 1998-99 season and cumulatively with a couple of higher observations at the commercial and light industrial stations.
- Dissolved and total zinc exhibit similar patterns for both the 1998-99 season and the cumulative data. There is substantial overlap among the different land uses although the mean and median for the light industrial station is highest in each case.
- Bis(2-ethylhexyl)phthalate was observed at all land use stations over time. The vacant and multi-family residential stations had higher means than other stations this season, but cumulatively observations overlap substantially. Means and medians for all stations exceed the Ocean Plan objective in the cumulative data set. Exceedance does not mean being out of compliance.
- Diazinon was observed in 43% of the mixed residential samples and 25% of the commercial samples this season. Due to a lowering of the detection limit from 0.25 µg/l to 50 ng/l, this was the first storm season diazinon was observed in this monitoring program. The detection limits were lowered at the request of the Regional Water Quality Control Board.

Water Quality Results (Critical Source/BMP Monitoring Study)

- For total and dissolved cadmium, the highest levels were observed at the auto dismantler sites and were below those of the mass emission stations.
- The fabricated metal sites showed the highest levels of both total and dissolved copper concentrations as compared with the auto dismantler and repair sites. The value for dissolved copper also exceeded the means for the mass emission and CIT stations.
- The highest concentrations of total and dissolved lead occurred at the fabricated metal sites. All values exceeded the Ocean Plan objective for total lead of 20 ppb and the Toxics Rule objective for dissolved lead of 50 ppb. Exceedance of the objective does not mean being out of compliance.
- The highest dissolved zinc concentration was observed at the fabricated metal sites as compared with the auto repair and the auto dismantler sites. Total and dissolved zinc concentrations were higher than both mass emission and CIT stations.
- The highest TDS value was observed at auto dismantler sites (mean of 127.3 ppm) followed by fabricated metal and auto repair sites, and were lower than the CIT levels (mean of 187.4).
- The highest TSS value was observed at auto repair sites (mean of 205.8 ppm) followed by auto dismantlers and fabricated metals, and exceeded mass emission levels (mean of 154 ppm).
- The highest COD levels were observed at auto repair sites (mean of 132.8 ppm). Last year's highest levels (mean of 231 ppm) were observed in the auto dismantlers group. These observations were higher than the mass emission and CIT levels.
- TPH was not detected as gasoline or diesel. These results compare favorably with the 1997-98 results, which had a high mean of 29 ppm. Two possible reasons could be voluntary installation of Best Management Practices by the owners, or lower overall rainfall and smaller storms.
- Total organic carbon was the highest at auto repair sites during the 1998-99 storm season, which was higher than both the current mass emission and CIT maximum values.

RECOMMENDATIONS

The Permit states that if a given constituent is not detected in at least 25% of the samples taken in ten consecutive storm events then that constituent may qualify for removal from the analytical suite for the associated station. For both mass emission and land use stations several constituents met this criterion. It is recommended that these constituents be removed from the analytical suite for the associated stations.

The Permit allows the discontinuation of monitoring at a land use station for specific constituents once the event mean concentration (EMC) is derived at the 25% error rate. As mutually agreed upon with the RWQCB, we decided to use the mean standard error as a substitute for error rate (Swamikannu, 1999). Seventy-six station-constituent combinations met the criterion and it is recommended that monitoring be discontinued for these constituents at the associated stations.

All constituent-stations combinations for which discontinuation of monitoring is recommended for either of these two criteria are summarized in Table ES-1.

It is recommended that the BMPs that will be installed for the auto dismantling and auto repair companies for the 1999-2000 storm season be of the preventive type. For example, they should

include methods to keep raw, finished, and waste materials off the ground, sheltered from the rain, or stored in protective enclosures. They should also include spill containment and cleanup practices. As such, they will be expected to prevent pollutants from entering the storm drain system. Therefore, the concentrations of total and dissolved metals, total suspended and dissolved solids, oil and grease, TPH, specific conductance, and COD should be reduced in the test sites.

The BMPs for fabricated metal companies in the 1999-2000 storm season will be similar in nature to those being installed at the auto dismantling and repair companies, but may also include structural, treatment type BMPs. At the time of the writing of this report, a final decision has not been made. Factors affecting the decision include the results of a technical evaluation of the treatment methods, the funding available, the time available to install, and the feasibility of their being installed at other businesses when this study is over.

Table ES-1a. Station-Constituent Combinations Recommended for Discontinuation of Monitoring

Mass Emission Stations

Analyte	Station				
	Ballona Creek	Malibu Creek	Los Angeles River	Coyote Creek	San Gabriel
Conventionals					
Cyanide	x	x	x		
TPH		x			x
Total Phenols	x	x		x	x
MBAS		x			
Metals					
Aluminum		d only			
Antimony	d and t	d and t	d and t	d and t	d and t
Arsenic	d and t	d and t	d and t	d and t	d and t
Beryllium	d and t	d and t		d and t	d and t
Cadmium	d and t	d and t		d and t	d and t
Chromium	d and t	d and t		d and t	d and t
Chromium 6+	d and t	d and t	d and t	d and t	d and t
Copper		d only			d only
Lead	d only	d and t		d and t	d and t
Manganese	d only	d only		d only	d only
Mercury	d and t	d and t	d and t	d and t	d and t
Nickel	d only	d only		d only	d only
Selenium	d and t	d and t	d and t	d only	d and t
Silver	d and t	d and t	d and t	d and t	d and t
Thallium	d and t	d and t	d and t	d and t	d and t
Pesticides					
All Pesticides		x	x	x	x
Chlordane	x	x	x	x	x
N-Pesticides	x	x	x	x	x

Notes:

x = constituent which meets the criterion of less than 25% detection in ten consecutive samples

d and t = dissolved and total

d only = dissolved only

- = fails test

blank cell = not enough data to analyze

Table ES-1b. Station-Constituent Combinations Recommended for Discontinuation of Monitoring

Land Use Stations

Analyte	Station															
	Santa Monica Pier		Sawpit Creek		Project 620		Dominguez Channel		Project 1202		Project 474		Project 404		Project 156	
	Criterion 1	Criterion 2	Criterion 1	Criterion 2	Criterion 1	Criterion 2	Criterion 1	Criterion 2	Criterion 1	Criterion 2	Criterion 1	Criterion 2	Criterion 1	Criterion 2	Criterion 1	Criterion 2
Conventionals																
Total Phenols							x									
MBAS			x													
Minerals																
Ammonia								x		x		x				
Phosphorus						d and t		d and t		d and t		t only				
NH3-N								x		x		x				
Nitrate				x				x		x		x		x		x
Nitrate-N				x				x		x		x		x		x
Nitrite-N				x				x		x		x		x		x
TKN						x		x		x		x		x		x
TSS						x		x		x		x				
Metals																
Aluminum	d only		d only										d only		d only	
Antimony	d and t		d and t		d and t		d and t		d and t		d and t		d and t		d and t	
Arsenic	d and t		d and t		d and t		d and t		d and t		d and t		d and t		d and t	
Beryllium	d and t		d and t		d and t		d and t		d and t		d and t		d and t		d and t	
Cadmium	d and t		d and t		d and t		d only	t only	d and t		d and t		d and t		d and t	
Chromium	d and t		d and t		d and t		d and t	t only	d and t	t only	d only		d and t		d and t	
Chromium 6+	d and t		d and t		d and t		d and t		d and t		d and t		d and t		d and t	
Copper			d only			d and t		d and t		d only		d only		d and t		
Iron			d only												d only	
Lead	d only		d and t			t only	d only	t only	d only	t only	d only		d and t		d only	
Manganese	d and t		d only				d and t		d and t				d and t		d and t	
Mercury	d and t		d and t		d and t		d and t		d and t		d and t		d and t		d and t	
Nickel	d only		d and t		d and t			d and t	d only	d and t	d only		d only		d and t	
Selenium	d and t		d and t		d and t		d and t		d and t		d and t		d and t		d and t	
Silver	d and t		d and t		d and t		d and t		d and t		d and t		d and t		d and t	
Thallium	d and t		d and t		d and t		d and t		d and t		d and t		d and t		d and t	
Zinc			d only			t only		d and t		d and t		d only		d and t		d only
Pesticides																
All Pesticides	x		x		x		x		x		x		x		x	
Chlordane	x		x		x		x		x		x		x		x	
N-Pesticides	x		x		x		x		x		x		x		x	

Notes:

Criterion 1 = <25% detections in ten consecutive samples

Criterion 2 = <25% mean standard error

x = constituent which meets the criterion noted

d and t = dissolved and total

d only = dissolved only

t only = total only